

by Charles E. Taylor, SEM Historian



Milt Leven with a large epoxy model of a reactor pressure vessel

**MILTON M. LEVEN**  
**SESA President 1956-1957**

## THE PHOTOELASTICIAN'S PHOTOELASTICIAN

Milt Leven was the ideal role model for many photoelasticians of my vintage. The period from the late 1940s to the early 1970s was the golden era for photoelasticity. During those years three-dimensional photoelasticians considered themselves to be working on the cutting edge of science, and at that time there were no CNN hourly polls to either confirm or deny the assertion. After all, the Cold War, the emergence of nuclear reactors, and the sudden appearance of Sputnik triggered unprecedented proliferation of demands for better ways to analyze complex engineering structures. Although a few huge digital computers were being built, adequate software just didn't exist then and practical computer solutions to the problems had to wait for decades. Experimental techniques, especially strain gages and photoelasticity, were the best tools that engineers had to design innovative structures where both reliability and light weight were of utmost importance.

In the 1960s I often heard Milt Leven referred to as "the photoelastician's photoelastician." His fringe photographs were simply the best and were the envy of all who worked in the field. His complicated three-dimensional models were fabulous, and he developed many innovative techniques. He was a modest, unassuming person who would readily share his information with anyone at any time. By example Milt showed us that researchers in a given field could be civil in dealing with each other and could even benefit by cooperation - a concept that seemed to have eluded the previous generation of photo-elasticians. I believe that my contemporary photoelasticians genuinely liked each other and followed Milt's lead. One evening during each of the semiannual meetings was invariably devoted to an informal session of the photoelasticians and anyone else who wanted to join us. We discussed what projects we were working on, what we planned to do, and what needed to be done. The publication backlog in those days was rather long and so we discussed things about two years before they came out in print.

Investigators all over the world joined the hunt for suitable materials. Epoxy resins showed promise but they were used mainly as adhesives and manufacturers had little interest in photoelasticians as potential customers since they provided a very small market. The progress in photoelastic materials was due to Milt Leven and his colleagues, Bob Sampson and Bob Johnson, at the Westinghouse Research Laboratories. They made extensive studies of many commercially available epoxy resins. More importantly, they published Westinghouse Reports and papers giving recipes for catalysts and other additives, curing cycles, test temperatures, etc. Their work set three-dimensional photoelasticity ahead several years, so that the rest of us working in the field could easily and immediately cast our own models.

Soon after I joined the SESA, Milt asked me to join the SESA Papers Committee, of which he was chairman. That was my first SESA assignment. After that, I followed Milt Leven through the various committees and offices of the SESA in which he performed with skill and dignity. Milt Leven was always my ideal both as a photoelastician and as a society officer.

While working at Westinghouse, Milt also taught some courses at Carnegie Tech and there made another notable contribution to experimental stress analysis. Jim Dally and Bill Riley were young graduate students in one of his classes. I am sure that you will recognize the name of those SESA stalwarts. Both of them have credited Milt Leven as sparking their interest in mechanics and told me that they shared my admiration for Milt. Bill Riley and his contemporary photoelastician Ros Guernsey are no longer living but I am sure that they would have contributed to this testimonial for Milt Leven. Jim Dally, who is very much alive, wrote the following:

### "Memories about Milt Leven"

1. Bill Riley and I took an evening course in Advanced Strength of Materials from Milt in the fall of 1952 at what was then known as Carnegie Institute of Technology. We were both attending night school working toward a masters degree. Milt was a friendly instructor and he made sense of Timoshenko's many derivations. At the time Bill and I were both working for Mesta Machine Company in Homestead, PA and had no idea that we would later encounter Milt as the best photoelastician in the world.

2. My second experience with Milt was in the spring of 1960. I was a young Assistant Professor at Cornell University, and had invited Milt to present a seminar on three-dimensional photoelasticity to our department (Mechanics and Materials). He drove up to Ithaca from Pittsburgh and joined a few of us for dinner at our home that first evening. The next day he presented his outstanding work on photoelastic studies of reactor pressure

vessels. He visited my laboratory and shared information about epoxy formulations for model materials and important insights on how to face slices without chipping the edges.

3. Milt shared his information freely. In fact our book on *Experimental Stress Analysis* contains many of his figures to illustrate 3-dimensional photoelastic methods.

Milt passed away at a very young age. In spite of his short time with us, he made a major impact on the young photoelastic community. Those who interacted with him are now getting long of tooth, but we remember him with very fond memories. - - Jim Dally

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This tribute appeared in *Experimental Mechanics* in 1979:

After a prolonged illness, Milton M. Leven passed away on April 22, 1979. Mr. Leven was a long-time, active member of the Society for Experimental Stress Analysis, having served as chairman of the Papers Committee, member of the Executive Committee, and ultimately president during the 1956-1957 term. In 1968 he was made an Honorary Member of the Society.

In addition, Mr. Leven was the recipient of almost every other top honor that the SESA has to offer. In 1972 he was the Murray Lecturer at the Fall Meeting in Seattle. That same year, he received the Tatnall Award and in 1975, was made a Fellow Member of the Society. In 1979 he was honored with the Lazan Award.

Mr. Leven joined the Westinghouse Research Laboratories in 1946, where he was engineer in charge of the Photoelastic Laboratory, became fellow engineer in 1954 and advisory engineer in 1966. In 1967 he was made manager of experimental mechanics, a position he held until 1977 when he retired from Westinghouse.

He received both his BS in electrical engineering in 1935 and his MS in mechanics in 1940 from the Carnegie Mellon University. Starting in 1935, he was instructor and research assistant in the mechanics department at Carnegie Mellon until 1942. After serving four years in the U.S. Navy, he became associated with the Westinghouse Research Laboratories.

Mr. Leven's principal interests were in three-dimensional photoelasticity, which he applied successfully to the design of nuclear vessels and components as well as turbo-machinery components. In 1967, he became concerned with mechanics of materials in the area of creep and fatigue. He later served on the Metals Properties Council Subcommittee III on low-cycle fatigue.

Mr. Leven contributed much to the literature in the field of experimental mechanics and many of his papers were published by the SESA. In 1969, he edited the book *Photoelasticity The Selected Scientific Papers of M.M. Frocht*.

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We all were fortunate to have Milt as a colleague and friend. ■